PSYCHOLOGICAL LITERATURE

Mendel's Principles of Heredity, by W. BATESON. Cambridge, The University Press; New York, G. P. Putnam's Sons, 1909. pp. xiv, 396. Price $3.50 net.

In 1902 Professor Bateson published, under the title *Mendel's Principles of Heredity: a Defence*, a translation of Mendel's paper on Hybridization, together with a brief summary of Mendelism as then developed. The book quickly went out of print, and was not republished. The object of the present work, which in a sense takes the place of its predecessor, is to give a succinct account of discoveries in regard to heredity made by the application of Mendel's method of research. Theoretical considerations, the bearing of the new facts on the great problems of biology, are here reduced to the briefest possible indication; they will be dealt with separately in another book, based on the author's Silliman Lectures of 1907.

We have before us, then, a sort of text-book of Mendelism, in so far as the doctrine is capable of representation in text-book form, written by one of its foremost expositors. Ch. i, Introductory: Mendel's Discovery, gives a brief historical outline, and thereafter illustrates and defines various technical terms: dominant and recessive, segregation and allelomorphism, homozygote and heterozygote, purity of type. "The fact of *segregation* was the essential discovery which Mendel made. . . . The *dominance* of certain characters is often an important but never an essential feature of Mendelian heredity. . . . Purity of type is dependent on gametic segregation, and has nothing to do with a prolonged course of selection, natural or artificial." The account given of these fundamental matters is condensed, and needs careful reading, but is sufficiently clear to the advanced student.

Ch. ii, The Material Investigated, begins with a very useful selected list of structural characters in plants (36) and animals (25) whose inheritance follows the general rules described in the preceding chapter. References to the original memoirs, and brief summaries, are appended in every case. The author then turns to the subject of color, which is presently to occupy him through several chapters, and enumerates the animals and plants in which color characters have been shown to have a Mendelian inheritance. In conclusion, he touches on various general questions. No class of characters has as yet been identified to which the Mendelian system is demonstrably inapplicable, though the future cannot, of course, be foretold. One meristic character (brachydactyly in man) is Mendelian; the study of such characters is now of especial importance. Mendelian principles have been proved to apply to wild types, and are thus not confined to unions of pure races. There is no distinction between inter-racial and intra-racial heredity. Dominance is not necessarily an attribute of the phylogenetically older character. A dominant character is the condition due to the presence of a definite factor; the corresponding recessive owes its condition to the absence of the same factor. The chapter ends with a statement of the salient differences between the Mendelian and the Galtonian theories of inheritance. The statement is admirably clear; and, indeed, the sharp division drawn between Mendelism on the one hand and biometry on the other is one of the best features of the book.

Ch. iii, Numerical Consequences and Recombinations, deals illustratively (combs of fowls, heterostylism in *Primula*) with the proportions of the F_2 generation and with novel types produced by recombinations.

The succeeding five chapters discuss in detail the problem of heredity of color. "Taking the evidence respecting the genetics of color as a whole, . . . there can be no reasonable doubt that with rare exceptions it will be found possible to express the whole series of phenomena as due to the combination and recombination of a limited number of recognizable factors, which are treated by the cell-divisions of gametogenesis as units. . . . One positive deduction cannot be overlooked: that the organism is so built that definite additions to, or subtractions from, its totality may readily be made by Variation, and that the consequence of such alteration of the ingredients may be recognizably definite or, to use another term, specific."

Ch. ix deals with gametic coupling and spurious allelomorphism. Certain phenomena "indicate a system of segregation taking place in such a way that gametes presenting certain . . . combinations occur with greater frequency than the others." Instances are drawn from the pollen-shape, contabescence of anthers, and color of the Sweet Pea. Spurious allelomorphism occurs when factors concerned with features of organization which seem to have no special physiological association behave as allelomorphic to each other. "Two dominant or 'present' factors behave as if in the cell-divisions of gametogenesis they repelled each other. . . . The dividing cell being *AaBb*, the daughter-cells are respectively *Ab* and *aB*." The author recognizes the possibility of disturbance by selective attraction between different kinds of gametes (selective mating), though much more evidence is required for anything like demonstration.

Ch. x reviews the facts relating to Heredity and Sex, with strict limitation, of course, to Mendelian experiments. The main outcome is that in certain forms the female is a sex-heterozygote, with femaleness dominant; the female is a hybrid, female-male, while the male is pure male, or male-male. Since, on the other hand, the cytologists show that in most orders of Insects proof that the male is heterozygous can be obtained, the author concludes: "Improbable as at first sight it may appear, the view that most commends itself to me is that in different types Sex may be differently constituted." The fact that the females of a true-breeding strain may be hybrid in some important respect, while the males are not, brings us a step nearer the discovery of the nature of Variation.

Ch. xi, on Double Flowers, we may pass over. Ch. xii, on Evidence as to Mendelian Inheritance in Man, brings together such observations of inherited traits, normal and abnormal, as can be found; the evidence, however, is scanty, since man has for some reason or other—hardly, one would think, for the reason alleged by the writer, the "special difficulties attending the study of human heredity;" since these are as great for Galtonians as for Mendelians—been left almost entirely to the biometrists. Eye-color, brachydactyly, cataract, tylosis, etc., are discussed in sufficient detail, and the chapter ends with a note on collecting evidence as to human descent: a note which gains in interest by the insertion of a slip, on which Professor Bateson confesses that his representation of the inheritance of color-blindness "contains a serious error." The reviewer may take occasion to say that, not only here but throughout the work, the author makes an impression of the utmost candor and frankness; mistakes and ignorance are signalized, no less than success and successful prediction (*cf.* p. 209, the mulatto; p. 128, the Basset hound).

Ch. xiii, on Intermediates between Varieties and the Pure Lines of Johannsen, is of crucial importance. Intermediate and gradational forms undoubtedly appear; how can Mendelism cope with them? Professor Bateson grants that analysis is as yet incomplete and must be laborious; but he urges that in many cases the intermediate character is provably only a superficial or net result of the interaction of factors which are transmitted as units. Sometimes, *e. g.*, the whole group of heterozygotes forms a recognizable class which may be described as intermediate between the two pure types (blue Andalusian fowl). Or intermediates may be due to subtraction-stages of dominant factors (color of the Dutch rabbit; half-dwarfness in peas), or to the interference of other factors (English pattern of rabbit; Painted Lady form of Sweet Pea). And finally there are intermediates due to the disturbing effects of many small causes not of genetic but presumably of environmental origin, fluctuational forms whose intermediacy is not transmissible. In view of all these possibilities, it is evidently incautious to assert that in any specific case segregation does not occur.

Ch. xiv takes up certain Miscellaneous Exceptional and Unconformable Phenomena, to wit, cases in which crosses breed true without segregation, departures from numerical expectation, irregularities of dominance, alternation of generations, maternal characters in embryos. In most instances, the author is able to suggest at any rate a possible and plausible explanation of the anomaly. Alternation of generations is, however, as he confesses, a phenomenon which at present is incapable of factorial representation.

Ch. xv briefly considers Biological Conceptions in the Light of Mendelian Discoveries. "Much that is known of chromosomes seems inconsistent with the view that they are the sole effective instruments in heredity." Variation must be regarded in the main as a phenomenon due to the addition or omission of one or more definite elements. Reversion occurs when the sum-total of the factors returns to that which it has been in some original type; reversion on crossing is thus merely the special case in which one or more missing factors are brought in by the parents of the cross-breed. As for the bearing of Mendelism on the theory of evolution, the following may be said. (1) In countless instances segregation plays a part in the constitution and maintenance of characteristics held by systematists to be diagnostic of species. De Vries' distinction of specific and varietal (non-segregating and segregating) characters cannot be accepted. (2) There is a real difference between fluctuating variations and actual genetic variations. By the latter alone can permanent evolutionary change of type be effected; and they are commonly, though not always, sufficiently discontinuous to merit the name Mutations. (3) There is nothing in Mendelism that runs counter to the doctrine of Natural Selection, although the scope of that principle is closely limited by the laws of variation.

The concluding chapter xvi, on the Practical Application of Mendelian Principles, should be read in connection with the Preface, which extends the discussion of what the fancier or breeder has to expect from Mendelism. Mendelian discovery, as we have seen, abolishes the old idea that time and continued selection are needed in order to make a variety breed true. Certain types are unfixable, for the simple reason that their special character is a special consequence of the meeting of dissimilar gametes. Sociologically, Mendelism suggests a mode of procedure the opposite of that favored by current eugenics; certain serious physical and mental defects, almost certainly also some morbid diatheses, and some of the forms of vice and criminality

could be eradicated if society so determined; but any attempt to distinguish certain strains as superior, and to give special encouragement to them, would probably fail to accomplish the object proposed, and must certainly be unsafe. The author adds that "society has never shown itself averse to adopt measures of the most stringent and even brutal kind for the control of those whom it regards as its enemies."

The book concludes with a biographical notice of Mendel, three portraits of whom are inserted, and with translations of Mendel's papers on Hybridization and on *Hieracium*. There are six colored plates, and a number of figures in the text. The mechanical side of the work is worthy of its spirit and contents. For though a new edition will be called for every few years, as facts accumulate and theories are revised, there can be little doubt that the *Principles of Heredity* will take rank as a classical exposition of its subject from the Mendelian standpoint. L. TURLEY.

American Primitive Music, with especial attention to the Songs of the Ojibways. By FREDERICK R. BURTON. New York, Moffat, Yard & Co., 1909. pp. v, 281+73+7. Price, $5.00 net.

Mr. Burton, who is a composer of recognized merit and has served as musical expert in the ethnological departments of the American Museum of Natural History and the Field Columbian Museum, has written this book rather as musician than as ethnologist. "That Indian songs may be useful to civilization, that is, that they have great art value, I thoroughly believe, and I should be lacking in the courage of my convictions if I did not make such demonstration of my belief as lies in my power." Nevertheless, he realizes that the acoustical side of primitive music cannot be ignored even by one who applies himself mainly to the æsthetic, and accordingly does not scruple to express his dissent from the conclusions of certain ethnological enquirers who have previously written on the subject of Indian music.

To illustrate the artistic value of the Ojibway song, the author has selected twenty-eight numbers from his collection, has adapted to them English verse suggested by the Indian originals, and has provided them with pianoforte accompaniment; some of the songs he has also arranged for unaccompanied mixed quartette. Opinions will doubtless differ, both as to the intrinsic value of the themes and as to the possibility of any widespread infusion of Indian ingredients into our own music: the reviewer must acknowledge that, in his judgment, many of these songs have both charm and virility.

Mr. Burton has, further, given the notation of his whole collection of nearly one hundred songs as recorded by the phonograph, together with the Indian words (so far as intelligible) and their English translation. The notation raises, of course, the whole question of scale. The writer ascribes to the Ojibways two pentatonic scales, major (*sol, mi, re, do, la, sol*) and minor (*mi, re, do, la, sol, mi*); each of these is developed by the addition of one tone which brings about a scale relationship closely analogous to the ancient hexachord; major, *sol, mi, re, do, si, la, sol*, and minor, *mi, re, do, si, la, sol, mi*. There are also certain songs that appear to be based upon the diatonic major scale of civilization. How far all these things are original, and how far their finish and perfection are due to civilized influence, Mr. Burton does not attempt to say; it is enough for him to appreciate the primitive character of the music as a whole. He has, however, in his remarks upon Mr. Gilman's examination of the Hopi songs, an argument that is suggestive, and may be outlined here. Choruses, he says, composed of persons who know the scale